



HUGO PETERSEN
Verfahrenstechnischer Anlagenbau

Engineering is our passion

www.hugo-petersen.de

Strong Performance through Innovation



|| Axel Schulze (Managing Director)

Founded in 1906, HUGO PETERSEN GmbH can look back on more than a 110 year success story. Today, the company enjoys an excellent international reputation, in the industry, as an innovative specialist for process engineering, especially in the field of sulphuric acid processes and gas cleaning. Our experts in Wiesbaden are continually working on the optimization of processes and technology. Our wide range of services includes not only the design and construction of individual components and the delivery of complete plants, but also the modernization and modification, of existing plants.

HUGO PETERSEN GmbH is part of the CAC group (Chemieanlagenbau Chemnitz GmbH). Both partners work together, from initial consulting through to commissioning, to realise new turnkey plants. More than 900 projects have already been successfully implemented, for customers in the chemicals, metals and minerals and pharmaceutical industries. The basis of success is built on a team of experienced and competent experts. With great innovative strength, the technological challenges of the

customers are met, day in, day out. HUGO PETERSEN GmbH has diverse expertise, in particular in the fields of environmental technology and chemical plant engineering.

HUGO PETERSEN GmbH is your partner for

- // Competent consulting services
- // Process development and process engineering
- // Project Management
- // Engineering Technology
- // Procurement and supply
- // Construction supervision
- // Commissioning
- // Turnkey Plants
- // Shut-down Management

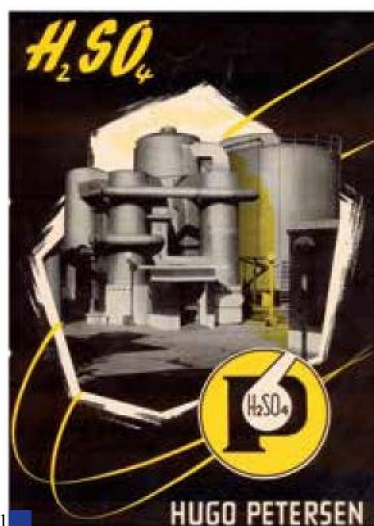
Successful in the best tradition

HUGO PETERSEN GmbH never stands still. Instead, the experts are systematically working on the further development of new technology. Over many years, the main business focus has been on sulphuric acid plants, which run on the basis of dry catalysis, wet

catalysis or oxidative wet cleaning, for diverse SO₂ sources. The numerous patents and approvals already accumulated are the best proof of the strong performance of the company.

Historical Milestones

- 1906** Founding of the company Hugo Petersen.
- 1916** First order for the construction of a turnkey sulphuric acid plant.
- 1923** Commissioning of the first Petersen-built tower plant.
- 1938** Construction of the first sulphuric acid contact plant.
- 1967** First sulphuric acid double-contact plant under licence to Bayer on stream
- 1982** Delivery of the first self-feeding liquid-spray separator, the Petersen Turbo Agglomerator (PTA).
- 1984** Development of SO₂-enrichment process SO₂^{REC}
- 1985** Introduction of the new wet electrostatic filter generation in the sulphuric acid technology.
- 1989** Commissioning of an activated carbon adsorption for a large power plant.
- 1991** Supply of plant for dioxin removal.
- 1994** Construction of an SCR plant for NO_x removal, using a petrochemical cracking process.
- 1995** Supply of a complete sewage sludge treatment plant.
- 1996** Construction of a flue gas dust collecting plant, following the combustion of nuclear waste.
- 1997** Retrofitting of a wood-fired power plant with a dry sorption and combined-SCR, for NO_x and dioxin removal.
- 1998** Planning order to build a production plant for catalyst production.
- 1999** Construction of a chemical plant for the reduction of products in a hydrogen atmosphere.
- 2000** Commissioning of the first "Petersen Jet Absorber" (PSA).
- 2002** Completion of the construction of a sulphuric acid plant with nearly „zero emissions“.
- 2003** Successful commissioning of the first SUPER^{OX}Scrubber. Highly efficient SO₂ separation with a simultaneous production of sulphuric acid.
- 2003** Improved SO₂converter design to increase service life.
- 2005** Presentation of ENER^{REC} as an energy recovery design for sulphuric acid plants.
- 2007** Introduction of the new PHE Wet Electrostatic Precipitator.
- 2009** Development of a compact anodically-protected shell and tube condenser.
- 2011** Launch of the MERCUR^{EX}B-GON process for maximum Hg removal from metallurgical gases.
- 2013** D-helical impact separator for pre-cleaning of polluted gases.
- 2015** New paradigm in heat exchanger design - the MBRF technology.
- 2016** 110 year anniversary of the company
- 2018** New FaFi-Distributor introduced



1 Brochure 1950's

2 First Tower Plant

3 Wet Catalytic Sulphuric Acid Plant

In the best hands, from the outset

Every project starts with professional and competent consultancy, conducted by HUGO PETERSEN's team of experts. The first step is to determine the exact requirements of the customer and the technological parameters, in order to develop a customised solution. Whether it is turnkey plants, modernization of individual components or implementation of customer-based processes: with the team from HUGO PETERSEN GmbH, you are in the best hands, right from the outset. There is also a focus on factors such as, efficiency, process safety, functionality and economic efficiency. The comprehensive consulting services range from site selection through to the complete preliminary design.

Using advanced planning tools, the process of the customer, is designed down to the last detail. Here, software solutions are used to ensure quick and quality-oriented engineering. Being a long-standing partner in this industry, the experts from HUGO PETERSEN GmbH, are also well informed about the relevant national and international industry standards.

The portfolio includes: //

Process Engineering //

Mechanical Engineering //

Apparatus Engineering //

Process Automation //

Electrical Engineering //

Structural Engineering //

Piping Engineering //

Procurement

All assembly and fabrication work is carried out by a team of experienced, well-trained employees. Thus, adherence to the highest safety and quality standards can always be guaranteed. The range of services, in addition to site management, field engineering and construction supervision, includes safety management and quality assurance (incl. materials management), commissioning of the plant and staff training.





Efficiency in Heat – The New MBRF-Heat-Exchanger

The level of SO₂-emissions at sulphuric acid plants is directly linked to temperature management for the conversion of SO₂ to SO₃, which is handled by gas-gas heat exchangers. The number of Gas-Gas-Heat exchangers in the conversion sections forces plant designers to investigate in more compact and efficient equipment as these units are cost extensive. HUGO PETERSEN GmbH as an innovative company in this area developed the next generation of shell and tube heat exchangers, keeping in mind the environmental as well as economical aspects.

The actual design of the radial flow heat-exchanger is its limited exchange surface to construction volume. The goal was to improve this ratio. This challenge has been successfully overcome in our new design the Multi-Bundle-Radial-Flow Heat-Exchanger (MBRF-HEX), which is not only an optimum combination of the positive properties of the existing designs. In contrast to the current radial heat exchanger design with single tube bundle the new design consists of a multiple tube bundle which results into a compact design by optimized pressure drop.

Out of this comparison the new design is far more promising than the existing ones. The first units demonstrate their excellence performance in several sulphuric acid plants. The new design assures that the gas distribution is nearly ideal and the effect of the MBRF-Concept supports the redistribution and homogenization

of the temperature profile after each bundle. CFD-studies are demonstrating superior performance of the Design. Even this year the concept convinced clients in replacing their HEXs by the new MBRF-Technology.

The existing installations coped with extreme flexibility by and in some replaced up to three existing conventional Gas-/Gas-Heat-exchangers. The picture at the left side shows a unit in a 1.500 t/d Mh pyrite/sulphur burning plant. The unit have considered mixed operation of pyrite/sulphur in front of the intermediate absorption.





Wet gas cleaning processes

Quench Cooler and Absorption Towers	Reliable gas cooling by evaporation and well-controlled absorption of noxious gas components by chemisorption
Jet-Scrubbing	Simultaneous dust-removal and absorption
Wet Electrostatic Precipitator	Aerosol-separation with highest efficiencies and lowest operating costs
Pressure-Jump Separator	Well-proven aerosol-separation stage for mists and noxious gas components
Multiventuri-System	High performance separation stage for dust and aerosols, adjusted to even the highest gas flow rates
Petersen Turbo Agglomerator	Self-conveying aerosol separator for new installations and revamping
Tail Gas Scrubbing-Processes	SUPER [®] and SUPER [®] SO ₂ -Removal to H ₂ SO ₄

Dry gas cleaning processes

Dry-Sorption	Separation stage for dust removal and adsorption HM and neutralization of acidic impurities
SCR-Process	Catalytic process for denitrification and oxidation of dioxins and furans
SNCR-Process	Noncatalytic process for denitrification by injection of ammonia or urea into the boiler
N ₂ O-Oxidation	Catalytic Reduction of N ₂ O
CO-Oxidation	Catalytic oxidation of CO
Activated Coke Filter	Adsorption stage for dioxins, furans and heavy metals

Specialists for Gas Cleaning

Gas cleaning has been part of the company's portfolio, for several decades. HUGO PETERSEN GmbH employees are able to support the complete spectrum of the different processes and technology. To achieve the best results, specific, needs-based processes are continually refined. Gas volumes of 500-500,000 Nm³/h can be handled easily. Components such as SO₂, HCl and HF are as reliably filtered as NO_x, heavy metals, dioxins and furans. The gas cleaning specialists at HUGO PETERSEN GmbH achieve a level far beyond the standard level. More than 600 projects have already been successfully implemented on this basis. Both individual components and complete plant systems, of different sizes and capacities, are available.

HUGO PETERSEN GmbH is your expert for wet and dry gas cleaning and aerosol separation.

Type of cleaning

- // Absorptive
- // Adsorptive
- // Catalytic
- // Mechanical

Products

- // sulphuric acid and oleum
- // SO₃ and SO₂ as a gas or liquid
- // CaSO₄, Na-Sulfite, Na₂SO₄(NH₄)₂SO₄
- // HCl and others

Focus on Environmental Protection

HUGO PETERSEN GmbH places a very high priority on both the careful use of all resources to save energy and systematic resource recovery, as an integral part of an everyday environmental protection plan. From the separated components, recyclables, such as FGD gypsum, are obtained for use in the construction industry or as an aggregate for ceramic and cement production. Also, sodium sulphite solutions for use in the beverage industry, Mg-sulphite solutions, ammonium sulphate, hydrochloric and sulphuric acid, oleum and SO₂ rich gases/-liquid and SO₃ gas/-liquid can be recycled.

HUGO PETERSEN GmbH relies on optimal technology which is particularly environmentally friendly and has low emissions. Systems that have been developed by the experts from Wiesbaden are as follows:

- // Quencher, Absorption Towers
- // Jet Scrubber
- // Wet Electrostatic Precipitator
- // Petersen Multi Venturi
- // Petersen Pressure Jump Separator (DSA)
- // Petersen Turbo Agglomerator (PTA)
- // Petersen-Centrifugal Agglomerator
- // Dry Sorption
- // Activated Carbon Filter
- // Catalytic Gas Cleaning
- // Catalytic reduction of NO, NO₂, N₂O (SCR Process)
- // Catalytic destruction of dioxins, furans, etc.

Step1

- Quantification of clients energy demand
- Qualification of the energy demand

Step2

- Frame conditions favourable to comply with the demand
- Investigation of providing quantity and quality of the required energies

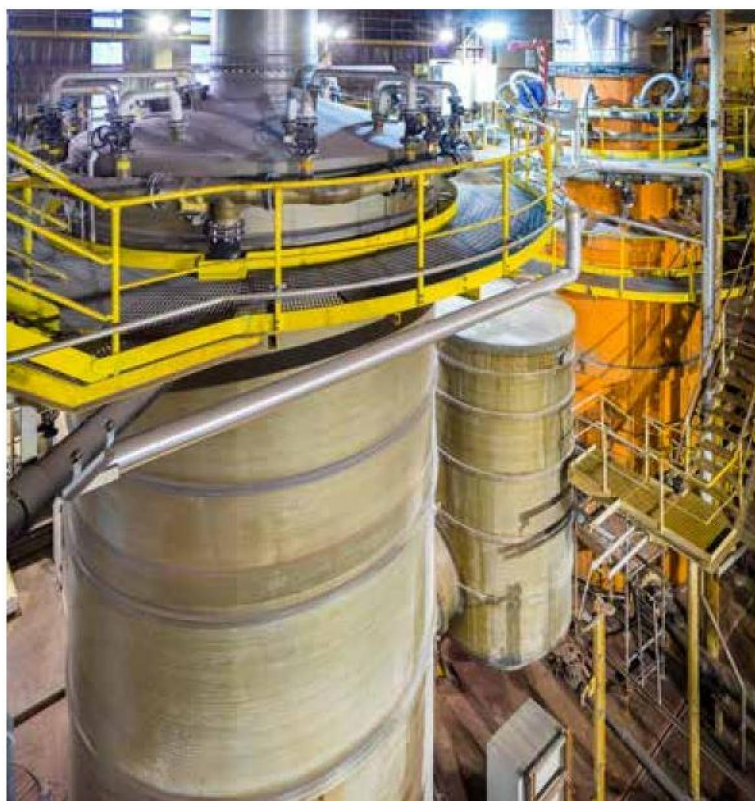
Step 3

- Development of an integrated energy concept
- Harmonizing the concept together clients engineering team

Step4

- Execution of the THR-Concept

Efficient Solutions for Sulphuric Acid Production



Particularly in the area of sulphuric acid production, HUGO PETERSEN GmbH has, for decades, been setting new technological standards, for example, through the introduction of the tower plant process, around 100 years ago. Sulphuric acid is mainly used for the production of fertilizers and in the synthetic fibre and oil industries. Mostly, it is only used as a medium for the production of another product. Accordingly, the issue of recycling is important, for which, the experts from HUGO PETERSEN GmbH have developed some attractive solutions.

HUGO PETERSEN GmbH does not have off-the-shelf plants. All technological solutions are adapted to the specific customer requirements, to achieve the best possible results. As sources for the sulphuric acid plants, HUGO PETERSEN GmbH relies on metallurgical and elemental sources and spent acid. Products are sulphuric acid, of any kind, oleum, SO_3 and SO_2 as a gas or liquid and ammonium sulphate.

The processes used are as follows:

- // Dry Catalysis
- // Wet Catalysis
- // Petersen Tower Technology
- // SUPER^{OX}-Technology
- // SUPER^{CO}-Technology

Success has a reason

HUGO PETERSEN GmbH has already implemented, over the past years, more than 400 cutting-edge plants and individual components for plants, used in the production of sulphuric acid, oleum and SO_2/SO_3 .

The company delivers plants and products that enable a conversion rate of almost 99.92 %. As a technologically skilled, innovative partner, HUGO PETERSEN GmbH can be flexible and independent in the choice and implementation of the various applications and technology. Mention can be made at this point, of the self-developed systems ENER^{REC} and the innovative tool THRC-Total Heat Recovery. Environmental and efficiency factors always play a central role. The nearly 100 % reuse of the heat used, speaks for itself.

Contact

HUGO PETERSEN Verfahrenstechnischer Anlagenbau

HUGO PETERSEN GmbH
Industriepark Kalle-Albert
Rheingaustraße 190-196 D65203
Wiesbaden, Germany

Phone: +49 611 962-7820

Fax: +49 611 962-9099

contact@hugo-petersen.de

www.hugo-petersen.de

